


11-21

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PTO/SB/05 (11-00)

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# UTILITY PATENT APPLICATION TRANSMITTAL

(Only for new nonprovisional applications under 37 CFR 1.53(b))

Attorney Docket No.	082771.P258C
First Inventor	Tal I. Lavian et al.
Title	Method and Apparatus for Automatically Configuring a Network Switch
Express Mail Label No.	EL466329115US

## APPLICATION ELEMENTS

See MPEP chapter 600 concerning utility patent application contents

ADDRESS TO: Assistant Commissioner for Patents  
Box Patent Application  
Washington, DC 20231

- ☒ Fee Transmittal Form (e.g., PTO/SB/17)  
(Submit an original and a duplicate for fee processing)
- ☐ Applicant claims small entity status.  
See 37 CFR 1.27.
- ☒ Specification [Total Pages 19]  
(preferred arrangement set forth below)
  - Descriptive title of the Invention
  - Cross References to Related Applications
  - Statement Regarding Fed sponsored R & D
  - Reference to sequence listing, a table, or a computer program listing appendix
  - Background of the Invention
  - Brief Summary of the Invention
  - Brief Description of the Drawings (if filed)
  - Detailed Description
  - Claim(s)
  - Abstract of the Disclosure
- ☒ Drawing(s) (35 U.S.C. 113) [Total Sheets 10]
- Oath or Declaration [Total Pages 1]
  - ☐ Newly executed (original or copy)
  - ☒ Copy from a prior application (37 C.F.R. § 1.63(d))  
(for continuation/divisional with Box 18 completed)
    - ☐ DELETION OF INVENTOR(S)  
Signed statement attached deleting inventor(s) named in the prior application, see 37 CFR 1.63(d)(2) and 1.33(b)
- ☐ Application Data Sheet. See 37 CFR 1.76

- ☐ CD-ROM or CD-R in duplicate, large table or Computer Program (Appendix)
- Nucleotide and/or Amino Acid Sequence Submission (if applicable, all necessary)
  - ☐ Computer Readable Form (CRF)
  - Specification Sequence Listing on:
    - ☐ CD-ROM or CD-R (2 copies); or
    - ☐ paper
  - ☐ Statements verifying identity of above copies

## ACCOMPANYING APPLICATION PARTS

- ☐ Assignment Papers (cover sheet & document(s))
- ☐ 37 C.F.R. § 3.73(b) Statement ☐ Power of Attorney  
(when there is an assignee)
- ☐ English Translation Document (if applicable)
- ☒ Information Disclosure Statement (IDS)/PTO-1449 ☒ Copies of IDS Citations
- ☒ Preliminary Amendment
- ☒ Return Receipt Postcard (MPEP 503)  
(Should be specifically itemized)
- ☐ Certified Copy of Priority Document(s)  
(if foreign priority is claimed)
- ☐ Request and Certification under 35 U.S.C. 122 (b)(2)(B)(i).  
Applicant must attach form PTO/SB/35 or its equivalent.
- ☐ Other.

18. If a CONTINUING APPLICATION, check appropriate box, and supply the requisite information below and in a preliminary amendment:

☒ Continuation ☐ Divisional ☐ Continuation-in-part (CIP) of prior application No: 09/079,890  
Prior application Information: Examiner V. Vu Group/Art Unit: 2758

For CONTINUATION OR DIVISIONAL APPS only: The entire disclosure of the prior application, from which an oath or declaration is supplied under Box 5b, is considered a part of the disclosure of the accompanying continuation or divisional application and is hereby incorporated by reference. The incorporation can only be relied upon when a portion has been inadvertently omitted from the submitted application parts.

## 18. CORRESPONDENCE ADDRESS

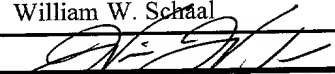
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Signature		Date	11/20/00

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# FEE TRANSMITTAL for FY 2000

Patent fees are subject to annual revision

TOTAL AMOUNT OF PAYMENT (\$ 710.00

## Complete if Known

Application Number  
Filing Date  
First Named Inventor Tal I. Lavian et al.  
Examiner Name V. Vu  
Group/Art Unit 2758  
Attorney Docket No. 082771.P258C

PTO  
08/16/00  
11/20/00

## METHOD OF PAYMENT (check one)

1. ☒ The Commissioner is hereby authorized to charge indicated fees and credit any overpayments to

Deposit  
Account  
Number

02-2666

Deposit  
Account  
Name

Blakely, Sokoloff, Taylor & Zafman LLP

- ☒ Charge Any Additional Fee(s) Required  
Under 37 CFR §§ 1.16, 1.17, 1.18 and 1.20

☐ Applicant claims small entity status  
See 37 CFR 1.27

2. ☒ Payment Enclosed:

☒ Check ☐ Credit card ☐ Money Order ☐ Other

## FEE CALCULATION

### 1. BASIC FILING FEE

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
101	710	201	355	Utility filing fee	710.00
106	320	206	160	Design filing fee	
107	490	207	245	Plant filing fee	
108	710	208	355	Reissue filing fee	
114	150	214	75	Provisional filing fee	

SUBTOTAL (1) (\$ 710.00

### 2. EXTRA CLAIM FEES

Large Entity		Small Entity		Extra Claims	Fee from below
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
18	20	0	0	0	18.00
3	3	0	0	0	80.00

Multiple Dependent

\*\*or number previously paid, if greater, For Reissues, see below

Large Entity		Small Entity		Fee Description
Fee Code	Fee (\$)	Fee Code	Fee (\$)	
103	18	203	9	Claims in excess of 20
102	80	202	40	Independent claims in excess of 3
104	260	204	135	Multiple Dependent claim, if not paid
109	80	209	40	**Reissue independent claims over original patent
110	18	210	9	**Reissue claims in excess of 20 and over original patent

SUBTOTAL (2) (\$

## FEE CALCULATION (continued)

### 3. ADDITIONAL FEE

Large Entity		Small Entity		Fee Description	Fee Paid
Fee Code	Fee (\$)	Fee Code	Fee (\$)		
105	130	205	65	Surcharge - late filing fee or oath	
127	50	227	25	Surcharge - late provisional filing fee or cover sheet	
139	130	139	130	Non-English specification	
147	2,520	147	2,520	For filing a request for reexamination	
112	920	* 112	920	*Requesting publication of SIR prior to Examiner action	
113	1,840	* 113	1,840	*Requesting publication of SIR after Examiner action	
115	110	215	55	Extension for response within first month	
116	390	216	195	Extension for response within second month	
117	890	217	445	Extension for response within third month	
118	1,390	218	695	Extension for response within fourth month	
128	1,890	228	945	Extension for response within fifth month	
119	310	219	155	Notice of Appeal	
120	310	220	155	Filing a brief in support of an appeal	
121	270	221	135	Request for oral hearing	
138	1,510	138	1,510	Petition to institute a public use proceeding	
140	110	240	55	Petition to revive - unavoidable	
141	1,240	241	620	Petition to revive - unintentional	
142	1,240	242	620	Utility issue fee (or reissue)	
143	440	243	220	Design issue fee	
144	600	244	300	Plant issue fee	
122	130	122	130	Petitions to the Commissioner	
123	130	123	130	Petitions related to provisional applications	
126	180	126	180	Submission of Information Disclosure Stmt	
581	40	581	40	Recording each patent assignment per property (times number of properties)	
146	710	246	355	Filing a submission after final rejection (37 CFR § 1.129(a))	
149	710	249	355	For each additional invention to be examined (37 CFR § 1.129(b))	
179	710	126	355	Request for Continued Examination (RCE)	
169	900	169	900	Request for expedited examination of a design application	

Other fee (specify)

Other fee (specify)

\*Reduced by Basic Filing Fee Paid

SUBTOTAL (3) (\$

## SUBMITTED BY

Name (Print/Type)

William W. Schaal

Registration No.  
(Attorney/Agent)

39,018

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(714) 557-3800

Signature

Date

11/20/00

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:

TAL I. LAVIAN, ET AL.

Application No.: Unassigned

Filed: Unassigned

For: **Method and Apparatus for  
Automatically Configuring a  
Network Switch**

Examiner: Unassigned

Art Group: Unassigned

**Which is a continuation of:**

In re Application of:

TAL I. LAVIAN, ET AL.

Application No.: 09/079,890

Filed: May 15, 1998

For: **Method and Apparatus for  
Automatically Configuring a  
Network Switch**

Examiner: V. Vu

Art Group: 2758

**PRELIMINARY AMENDMENT**

BOX PATENT APPLICATION  
Assistant Commissioner for Patents  
Washington, DC 20231-9998

Sir:

Prior to examination of the continuation application identified above, please accept  
the following amendments:

IN THE CLAIMS

Please cancel claims 1-15.

Please add new claims 16-33 as follows:

1           16.   (New) A network apparatus comprising:  
2           an external network data port;  
3           a network data monitor to monitor network data traffic over the external network data  
4 port, the network data monitor includes a memory and a set of monitor program instructions  
5 stored in the memory;  
6           a maintenance data port coupled to the memory of the network data monitor; and  
7           a processor coupled to the maintenance data port and in communication with the  
8 network data monitor, the processor to execute the set of monitor program instructions and  
9 to evaluate the network data traffic, the set of monitor program instructions comprises  
10 program instructions transferred to the memory through the maintenance data port.

1           17.   (New) The network apparatus of claim 16 further comprising:  
2 a network configurator in communication with the processor, the network configurator to  
3 automatically configure the network apparatus to permit a selected flow of network data  
4 through the external network data port in response to instructions received from the  
5 processor.

1           18.   (New) The network apparatus of claim 16, wherein the memory of the  
2 network data monitor is coupled to the processor to store data and the set of monitor  
3 program instructions.

1           19.   (New) The network apparatus of claim 16, wherein the maintenance data port  
2 is coupled to an external network maintenance station.

1           20.   (New) The network apparatus of claim 17, wherein the network configurator  
2 comprises a set of network configurator program instructions stored in the memory and  
3 executed by the processor.

1           21.   (New) The network apparatus of claim 20 wherein the set of network  
2 configurator program instructions comprises program instructions transferred to the memory  
3 through the maintenance data port from an external network maintenance station.

1           22.   (New) The network apparatus of claim 16, wherein the processor transfers  
2 information relating to network data traffic through the maintenance data port to an external  
3 network maintenance station.

1           23.   (New) A method for configuring a network switch including a maintenance  
2 data port, processor and memory, the method comprising:  
3           monitoring network data traffic;  
4           comparing the network data traffic to a threshold condition; and  
5           automatically configuring the network switch if the network data traffic meets the  
6 threshold condition by transferring a set of network configurator program instructions to the  
7 memory through the maintenance data port.

1           24.   (New) The method of claim 23, wherein prior to monitoring the network data  
2 traffic, the method further comprises transferring a set of monitor program instructions to the  
3 memory through the maintenance data port from an external network maintenance station.

1           25.     (New) The method of claim 23, wherein the set of network configurators  
2 program instructions are transferred from an external network maintenance station.

1           26.     (New) The method of claim 23 further comprising transferring monitor  
2 information about the network data traffic to an external network maintenance station through  
3 the maintenance data port.

1           27.     (New) The method of claim 23 wherein automatically configuring of the  
2 network switch comprises configuring the network switch in response to instructions  
3 received from the processor.

1           28.     (New) The method of claim 23 wherein automatically configuring of the  
2 network switch comprises configuring the network switch in response to instructions  
3 received from an external network maintenance station through the maintenance data port.

1           29.     (New) A network apparatus comprising:  
2           a maintenance data port to receive a first set of byte codes;  
3           a java virtual machine configured to receive the first set of byte codes and to convert  
4 the first set of byte codes into a first set of instructions;  
5           a memory in communication with the java virtual machine, the memory to be loaded  
6 with (i) the first set of instructions to monitor a flow of network data, and (ii) a second set of  
7 instructions to automatically configure the flow of network data; and  
8           a processor coupled to the memory, the processor to execute the first set of  
9 instructions and the second set of instructions.

1           30.   (New) The network apparatus of claim 29, wherein the maintenance data port  
2 receives the first set of byte codes from a network maintenance station.

1           31.   (New) The network apparatus of claim 29 further comprising:  
2 an external network data port.

1           32.   (New) The network apparatus of claim 31, wherein the flow of network data  
2 is monitored at the external network data port.

1           33.   (New) The network apparatus of claim 29, wherein the maintenance data port  
2 receives the set of byte codes from a network maintenance station.

**REMARKS**

This Preliminary Amendment is filed prior to initial review of the Application.

Applicant respectfully requests examination of all pending claims.

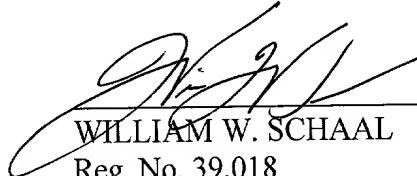
**CONCLUSION**

In view of the foregoing, Applicant respectfully requests examination of these claims at Examiner's earliest convenience.

Respectfully submitted,

BLAKELY, SOKOLOFF, TAYLOR & ZAFMAN LLP

Dated: November 20, 2000

  
\_\_\_\_\_  
WILLIAM W. SCHAAL  
Reg. No. 39,018



## UNITED STATES PATENT APPLICATION

for

METHOD AND APPARATUS FOR AUTOMATICALLY CONFIGURING A  
NETWORK SWITCH

Applicant:

Tal I. Lavian  
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Lyndon Y. Ong

prepared by:

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Lisa Fluhr  
(Typed or printed name of person mailing paper or fee)Lisa Fluhr  
(Signature of person mailing paper or fee)

# METHOD AND APPARATUS FOR AUTOMATICALLY CONFIGURING A NETWORK SWITCH

## FIELD OF THE INVENTION

5           This invention relates generally to data communications networks, and more particularly, to a method and apparatus for automatically configuring a network switch.

## BACKGROUND OF THE INVENTION

10           Computer networks are used to interconnect many computing resources, including computers, workstations, servers, printers, modems, and storage devices. For example, two or more computers may be connected together through a network. Network users are able to share files, printers and other resources, send messages and run applications on remote  
15           computers. An important part of any computer network includes the physical components or network communications devices used to interconnect the computing resources.

          One network communications device used to interconnect multiple computing resources is a chassis-based system designed to accommodate a  
20           number of internal cards. The computing resources such as computers are coupled to the internal cards of the chassis-based system. Once the computers are coupled to the internal cards, the computers are coupled to the network. To accommodate network growth, additional internal cards may be purchased and added to the chassis-based system. With the additional internal cards  
25           installed, additional computing resources may be added to the network. A disadvantage of these chassis-based systems is that there is a relatively large

initial investment when purchasing the chassis because of the large amount of overhead associated with chassis-based systems.

An alternative to expensive chassis-based systems is the use of less expensive standalone network communications devices or units that have a fixed number of ports for connecting computing resources or stations to the network. Such standalone network communications devices include stackable switches or the like. Although additional ports can not be added to each individual standalone unit, separate standalone units can be stacked, cascaded or coupled to accommodate network growth. As a result, there is a lower startup cost when establishing a computer network with the standalone units in comparison with chassis-based systems. Furthermore, network administrators still have the flexibility to increase the size of the network with the less-expensive standalone units.

FIG. 1 illustrates multiple network communications devices 103, 105, 107, 109 and 111 coupled together to form a computer network 101. Multiple computing resources (not shown) are coupled to each network communications device 103, 105, 107, 109 and 111. In one embodiment, network communications devices 103, 105, 107, 109 and 111 are stackable switches coupled together through bus 113. Bus 113 is used to tie together the switch network fabric of computer network 101. It is noted by one of ordinary skill in the art that the utilization of bus 113 is an extension of the chassis-based designs discussed earlier. The internal cards of the chassis-based systems are commonly coupled to high speed buses within the chassis-based systems.

The use of stackable switches allows network administrators to build systems having multiple physical ports to various computing resources on the network. Different types of network use patterns may typically be handled

most efficiently by different configurations of a network switch. Currently, a network administrator must manually monitor and analyze network traffic patterns, and also manually make any changes to the configuration of a network switch through the use of an external network maintenance station (NMS). Although some network switches may have data gathering and reporting capabilities, a network administrator must still take a considerable amount of time to analyze the network traffic pattern and manually reconfigure the switch. Delays in rerouting network traffic are directly related to the time required to analyze network traffic and reconfigure a network switch by a network administrator.

Therefore, there is a need for a way to automatically monitor and configure a network switch according to changes in network traffic. There is a further need to automatically configure a network switch which does not reduce the flow of data through the switch.

## SUMMARY OF THE INVENTION

The present invention provides a method and apparatus for automatically configuring a network switch having external network data ports, a processor, and memory. Network data is monitored on the external  
5 network data port. Information about the network data traffic is compared to one or more threshold conditions. The network switch is automatically configured if the network data meets one of the threshold conditions. The monitor and configuration functions can be performed by software running on the processor which has been downloaded from an external network  
10 maintenance station through a maintenance data port. Information about the network data traffic can be uploaded to the external network maintenance station through a maintenance data port.

## BRIEF DESCRIPTION OF THE DRAWINGS

The present invention is illustrated by way of example and may be better understood by referring to the following description in conjunction with the accompanying drawings, in which like references indicate similar elements and in which:

FIG. 1 shows a computer network coupled together with a bus architecture compatible with the present invention;

FIG. 2A-2F show alternative network switch configurations compatible with the present invention;

FIG. 3 shows a block diagram of a high level system architecture compatible with the present invention;

FIG. 4 shows a block diagram of a system architecture and protocol relationships compatible with the present invention;

FIG. 5 shows a block diagram of downloading intelligent agents compatible with the present invention;

FIG. 6 shows a block diagram of a Java application environment compatible with the present invention;

FIG. 7 shows a block diagram of an open system architecture compatible with the present invention;

FIG. 8 shows an auto-configuring network switch compatible with the present invention;

FIG. 9 shows a network switch with coprocessor compatible with the present invention;

FIG. 10 shows a system diagram of Java mobile agents compatible with the present invention.

**DETAILED DESCRIPTION OF A PREFERRED  
EMBODIMENT OF THE PRESENT INVENTION**

In the following description of a preferred embodiment, reference is made to the accompanying drawings which form a part hereof, and in which  
5 is shown by way of illustration a specific embodiment in which the invention may be practiced. It is to be understood that other embodiments may be utilized and structural changes may be made without departing from the scope of the present invention.

The present invention provides for a method and apparatus for  
10 automatically configuring a network switch having external network data ports, a processor, and memory. Network data is monitored on the external network data port. Information about the network data traffic is compared to one or more threshold conditions. The network switch is automatically configured if the network data meets one of the threshold conditions. The  
15 monitor and configuration functions can be performed by software running on the processor which has been downloaded from an external network maintenance station through a maintenance data port. Information about the network data traffic can be uploaded to the external network maintenance station through a maintenance data port.

20 For the purpose of illustration, one embodiment of present invention is described below in the context of a Java virtual machine in a Java development environment. Information and specifications relating to the Java development environment are described in the document "Java Virtual Machine Specification", October, 1997, Sun Microsystems. It will be  
25 recognized by one of ordinary skill in the art that the present invention may be used with other development environments without loss of generality, such as Microsoft Visual C/C++.

Java is a programming language similar to the object-oriented language C++, and consists of runtime libraries. These libraries provide a standard set of facilities for manipulating the user interface, communicating across a network, etc. Two Java runtime libraries, remote method invocation (RMI) and Java native interface (JNI) allow a single application to run on multiple hardware platforms without modification.

Java preferably isolates applications from both hardware and operating systems. Unlike traditional computer programs, which are almost always compiled for a hardware platform using tools that preclude their running on anything else, Java applications can be designed to run on any system that has a Java Virtual Machine (VM), also known as a Java Runtime Engine. The VM takes Java byte code and transforms it on the fly into instructions that can be executed by the PC. The same byte code can be interpreted as hardware-level instructions for any other platform with a VM implementation.

Java can be used to create two types of programs: applications and applets. Java applications, like those written in other languages, are standalone programs. They require a VM to run, but this runtime environment may be separate, embedded in the OS or in the application itself. Applets rely on a Web browser with a VM (such as Microsoft Internet Explorer or Netscape Communicator). Since applets are designed to be downloaded, they are also typically much smaller than applications.

In addition to platform independence, Java applications offer several other advantages. First, Java was designed for network computing and makes hiding the differences between local and remote resources easy. This allows Java to be used with thin-client computing, in which most of the processing and storage is handled by a server, while the client is used largely for display and interaction. Typical thin clients include network computers (NCs), which



are low-cost personal computers typically connected to a private or public network. Second, the Java programming language has a rigorous object-oriented model that makes it possible to build modular applications. An end user need only download a particular feature of a Java word processor when  
5 needed, for example. This dynamic design also lets developers create custom desktop environments that display only those applications required by each end user.

The Java platform or runtime environment is the platform that enables Java applications and applets to run on any system regardless of the  
10 operating system and underlying hardware. Rather than compiling code into a format designed for a specific platform, developers compile Java source code into an intermediate form, bytecode, which can be executed on any system with a runtime environment. A Class Loader transfers the Java bytecode to the Java Virtual Machine (JVM). As the heart of the Java platform, the JVM is  
15 basically a software CPU that sits between applications and the platform consisting of the operating system and hardware. The JVM interprets bytecode for the platform or uses a just-in-time (JIT) compiler to convert the bytecode to machine code for that specific platform. Java class libraries, which are files that make up the standard application programming interface (API) for  
20 applications and applets, are also loaded dynamically as needed.

The runtime system, which manages threads, memory, and other system resources, preferably executes the interpreted or machine code on the end platform. The program may be run within a browser as an applet, or as a standalone application.

25       JavaBeans are reusable building blocks that make up object-oriented Java programs. JavaBeans are defined by an API specification for a visual component architecture based on the Java language. Preferably, any Java

components conforming to the JavaBeans component model can be reused in any other JavaBean-compliant application.

The present invention is used to configure a network switch or other apparatus having a processor and memory which can be modified through software. FIG. 2A-2F show alternative network switch configurations typically chosen by a network administrator, and which may be automatically configured by the present invention. FIG. 2A shows a L2 switch configuration; FIG. 2B shows a configuration which routes or switches on any port; FIG. 2C shows a configuration which routes on all ports; FIG. 2D shows a configuration which creates virtual local area networks (VLANs) by policy or port; FIG. 2E shows a configuration which routes between VLANs with simple software configurations; FIG. 2F shows a configuration which demonstrates arbitrary network routing and switching. It will be recognized by one of ordinary skill in the art that configurations shown in FIGs. 2A-2F are for illustration purposes only, and that other configurations may be implemented with the present invention without loss of generality. Different applications or users may be assigned different priorities. For example, high level network applications such as real-time network monitoring and two-way voice and video may be given a low priority, equivalent to that of non-critical email or internet browsing. Alternatively, an important user such as a corporate CEO may be given a higher network priority than other employees.

FIG. 3 shows a block diagram of a high level system architecture compatible with the present invention. A network maintenance station (NMS) 301 may be coupled to a network routing switch 305 via a maintenance data port on the network switch 305. A preferred personal computer 303 running browser software may optionally communicate with both the NMS

301 and network switch 305. Network monitor software 311 may preferably be downloaded from the NMS 301 to a processor in the network switch 305 for monitoring network data traffic. The monitor software 311 is downloaded through a control data channel, preferably through the maintenance data port on the network switch 305, and not as network traffic being routed through the network switch 305. The use of a control channel preferably does not impact the flow of network traffic through the network switch 305. Once the network monitor software 311 has been downloaded to the network switch 305, events and information 315 relating to network traffic can be uploaded to either the NMS 301 or an applications server 307. Analysis of the network events 315 may be performed either by the processor on the network switch 305 or by the NMS 301 or applications server 307. Analysis of the network events 315 preferably involves monitoring the events 315 to see if they meet one or more of a set of predefined threshold conditions. If so, network configuration software 313 can be downloaded either from the NMS 301 or applications server 307 in reconfigure the network switch 305. An authentication server 309 may optionally be used to authenticate data and actions taking place on the network switch 305.

FIG. 4 shows a preferred system architecture and protocol. Browser software 401 may preferably communicate with a network switch 403 through a variety of protocols, including HyperText Transfer Protocol (HTTP) 405, and may also exchange software applets 407 with the switch 403. Optivity software may preferably communicate with the switch 403 through Simple Network Management Protocol (SNMP) 411 or through distributed optivity applications or oplets 409. An application server 415 may preferably communicate with the switch 403 through Remote Method Invocation (RMI) 421 or Java Beans 423.

FIG. 5 shows a preferred method of downloading intelligent agents. A network switch or routing device 501 contains a physical hardware layer 503, preferably including a processor and memory. An operating system 505 runs as a software application on top of the hardware layer 503. An implementation of a JVM 507 and internet protocol (IP) stack 509 runs on top of the operating system layer 505. A download channel 513, typically a maintenance data port, is used to download an intelligent agent 511 to the network switch 501. The intelligent agent 511 typically performs one or more functions, including but not limited to security 515, authentication of information 517, monitoring network data traffic 519, or automatically configuring 521 the network switch 501.

FIG. 6 shows a preferred Java application environment. A Java virtual machine 601 may run on top of a number of operating systems, including but not limited to JavaOS 603, Windows NT 605, Solaris 607, RT-OS 609, or others 611. System functions such as networking 613, utilities 615, programming languages 617, input/output (I/O) 619, and abstract window toolkit (AWT) 621 are all supported by the JVM 601. A network switch (API) 623 and network switch libraries 625 are used to support end user applications 627 or third party applications 629 running on the network switch.

FIG. 7 shows a preferred open system architecture compatible with the present invention. A network switch 701 includes a hardware layer 703, operating system 705, and a JVM 707. Java software libraries 709 and a data communications API 711 preferably run on top of the JVM 707. A download or control channel 715 is used to download applications programs including Java Beans 713, which communicate with the device 721 through a Java API 717 and a C/C++ API 719.

FIG. 8 shows an auto-configuring network switch compatible with the present invention. A network switch 801 communicates with a NMS 803 through a download channel 807. Monitor software 805 may be downloaded from the NMS 803 through the download channel 807. If a network event or information meets a threshold condition 809, network information may be optionally uploaded 811 to the NMS 803. An appropriate application 815 may be downloaded 813 from the NMS 803 in response to the uploaded network information.

FIG. 9 shows a network switch 901 with coprocessor 909 compatible with the present invention. In order not to impact the throughput of data on the network, configuration information is preferably sent through a maintenance port or control channel 913 rather than through the network switch data channel 903, 905. In addition, a coprocessor 909 is preferably used to run monitor and configuration software stored in memory 907 in order not to impact the flow of data through network ports 903 and processor 905. A data bus 911, preferably a PCI data bus, is used to transfer information between the processor 905, memory 907, coprocessor 909, and the maintenance data port 913. It will be recognized by one of ordinary skill in the art that changes may be made in the connections between and the types of processor, memory, and network components without loss of generality. For example, the memory may alternatively be connected directly to both the processor and coprocessor, or a data bus other than a PCI data bus, such as an ISA data bus, used to transfer information internally within the network switch 901.

FIG. 10 shows a system diagram of Java mobile agents compatible with the present invention. A network 1001 containing optivity software running on a NMS 1003 communicates via Java mobile agents 1004 with a file server 1005, which in turn may communicate via transferred agents 1006 with a

network switch 1007. The network switch 1007 may use transferred agents 1008 to communicate with another file server 1009, which uses transferred agents 1010 to communicate with a public network 1013 such as the internet via gateway 1011. Finally, the transferred agents 1012 may be used to

5 communicate with the NMS 1003.

While the invention is described in terms of preferred embodiments in a specific system environment, those of ordinary skill in the art will recognize that the invention can be practiced, with modification, in other and different hardware and software environments within the spirit and scope of the

10 appended claims.

## CLAIMS

What is claimed is:

- 1 1. A network apparatus comprising:  
2 an external network data port;  
3 a network data monitor coupled to the external network data port to  
4 monitor network data;  
5 a processor coupled to the network data monitor to evaluate network  
6 data; and  
7 a network configurator coupled to the external network data port and  
8 the processor to automatically configure the flow of network data through the  
9 external network data port in reponse to instructions received from the  
10 processor.
- 1 2. The apparatus of claim 1 further comprising a memory coupled to the  
2 processor to store data and program instructions.
- 1 3. The apparatus of claim 2 further comprising a maintenance data port  
2 coupled to the processor and the memory.
- 1 4. The apparatus of claim 3 wherein the maintenance data port is coupled  
2 to an external network maintenance station.

1 5. The apparatus of claim 3 wherein the network data monitor comprises  
2 a set of monitor program instructions stored in the memory and executed by  
3 the processor.

1 6. The apparatus of claim 5 wherein the set of monitor program  
2 instructions comprises program instructions transferred to the memory  
3 through the maintenance data port from an external network maintenance  
4 station.

1 7. The apparatus of claim 3 wherein the network configurator comprises a  
2 set of network configurator program instructions stored in the memory and  
3 executed by the processor.

1 8. The apparatus of claim 7 wherein the set of network configurator  
2 program instructions comprises program instructions transferred to the  
3 memory through the maintenance data port from an external network  
4 maintenance station.

1 9. The apparatus of claim 3 wherein the processor transfers monitor  
2 information through the maintenance data port to an external network  
3 maintenance station.



4 monitoring network data on the external network data port;  
5 comparing the network data to a threshold condition; and  
6 automatically configuring the network switch if the network data  
7 meets the threshold condition.

1 11. The method of claim 10 further comprising the step of transferring a set  
2 of monitor program instructions to the memory through a maintenance data  
3 port from an external network maintenance station.

1    12.    The method of claim 10 further comprising the step of transferring a set  
2    of network configurator program instructions to the memory through a  
3    maintenance data port from an external network maintenance station.

1    13.    The method of claim 10 further comprising the step of transferring  
2    monitor information about the network data to an external network  
3    maintenance station through a maintenance data port.

1    **14.**    The method of claim 10 wherein the step of automatically configuring  
2    the network switch comprises the step of configuring the network switch in  
3    response to instructions received from the processor.

1    15.    The method of claim 10 wherein the step of automatically configuring  
2    the network switch comprises the step of configuring the network switch in  
3    response to instructions received from an external network maintenance  
4    station through a maintenance data port.

## ABSTRACT

A method and apparatus for automatically configuring a network switch having external network data ports, a processor, and memory.

- 5 Network data is monitored on the external network data port. Information about the network data traffic is compared to one or more threshold conditions. The network switch is automatically configured if the network data meets one of the threshold conditions. The monitor and configuration functions can be performed by software running on the processor which has
- 10 been downloaded from an external network maintenance station through a maintenance data port. Information about the network data traffic can be uploaded to the external network maintenance station through a maintenance data port.



Fig. 2A

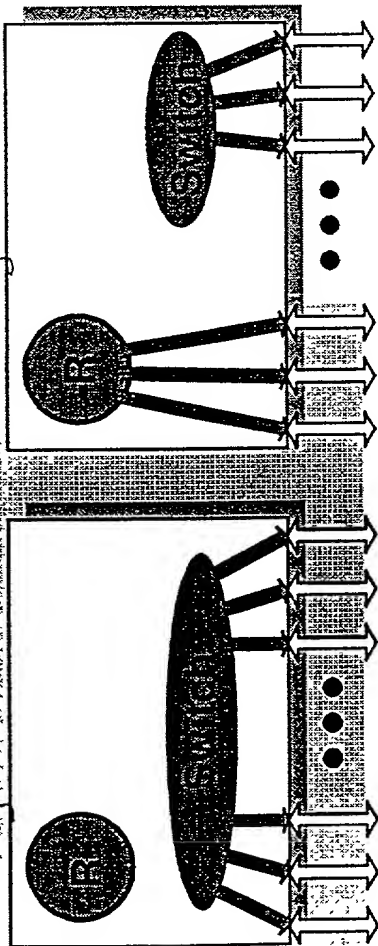
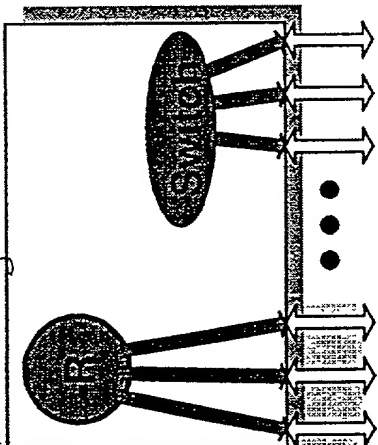


Fig. 2B



F.9.2C

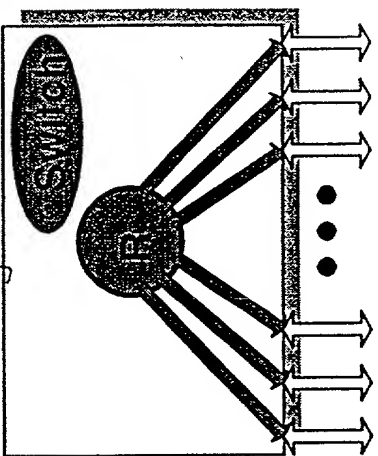


Fig. 20

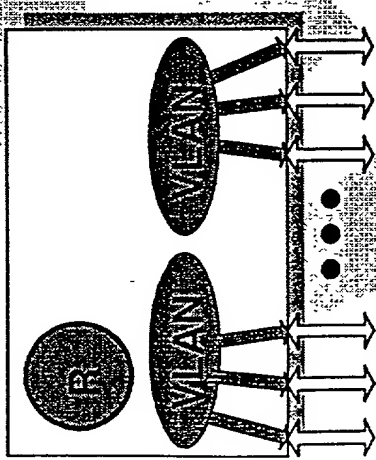


Fig. 2E

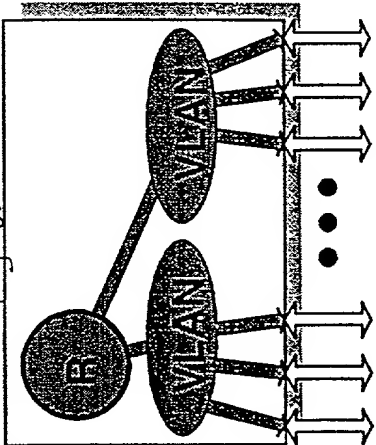
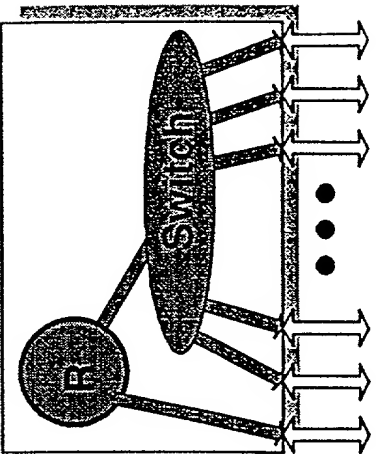


Fig. 2E



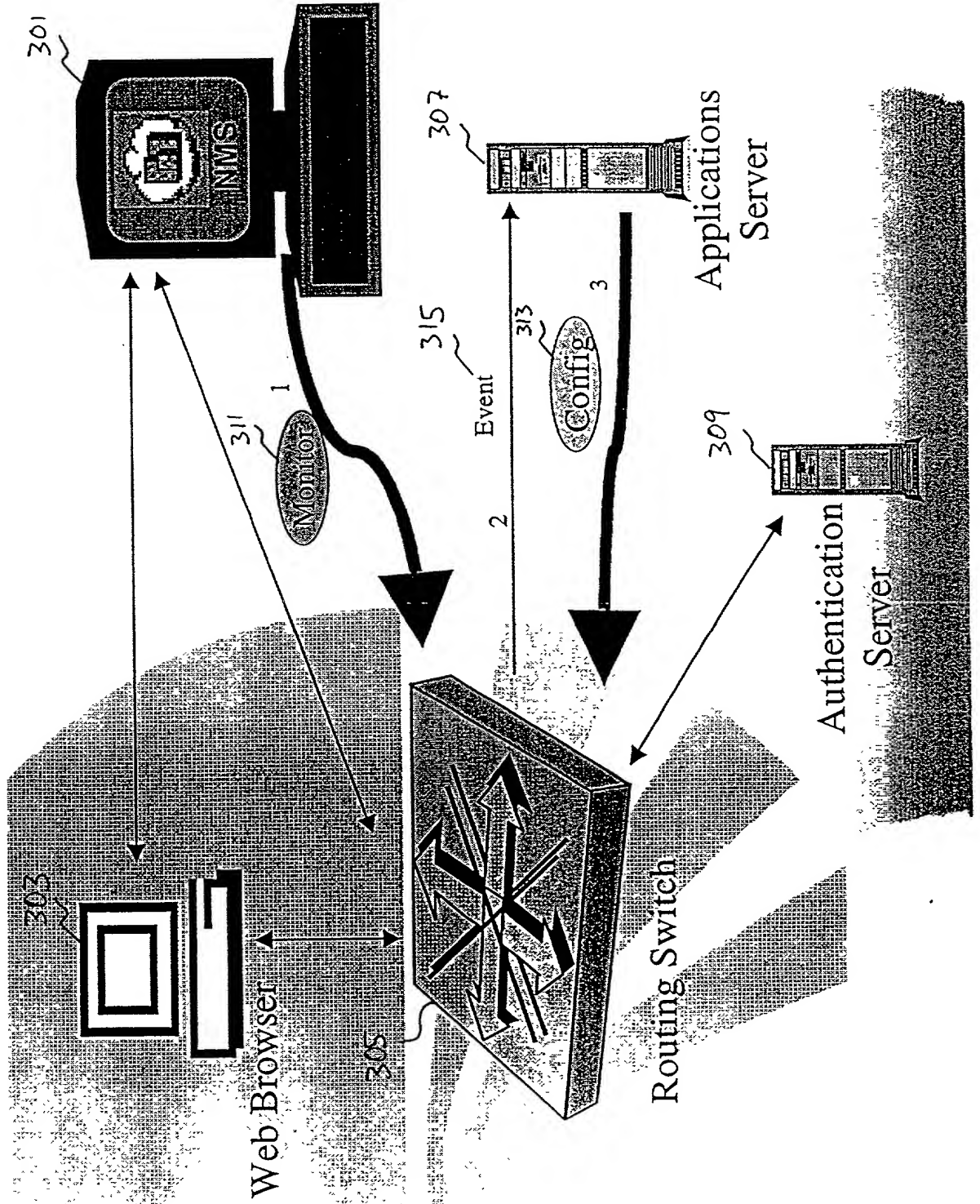
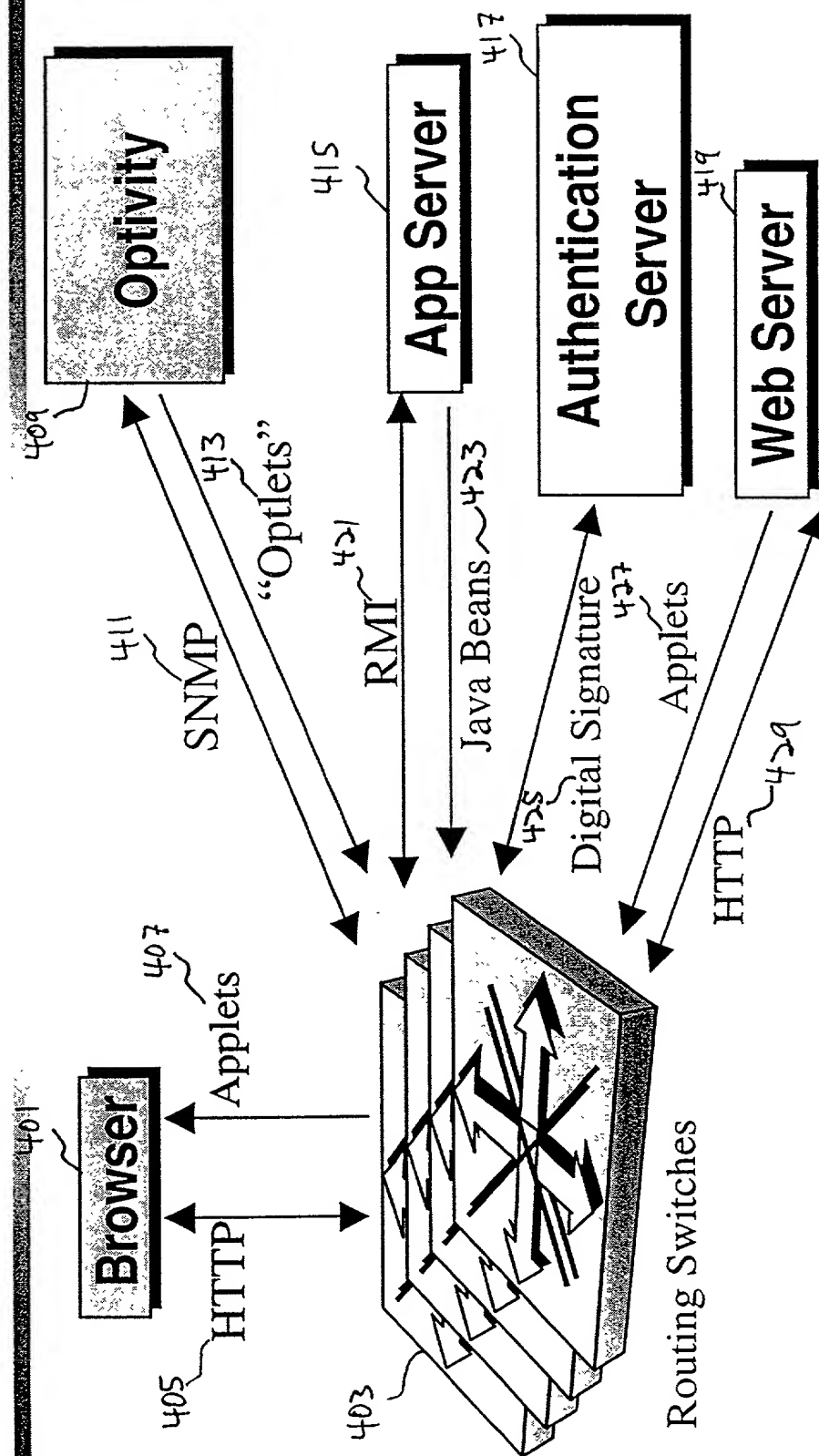


Fig. 4



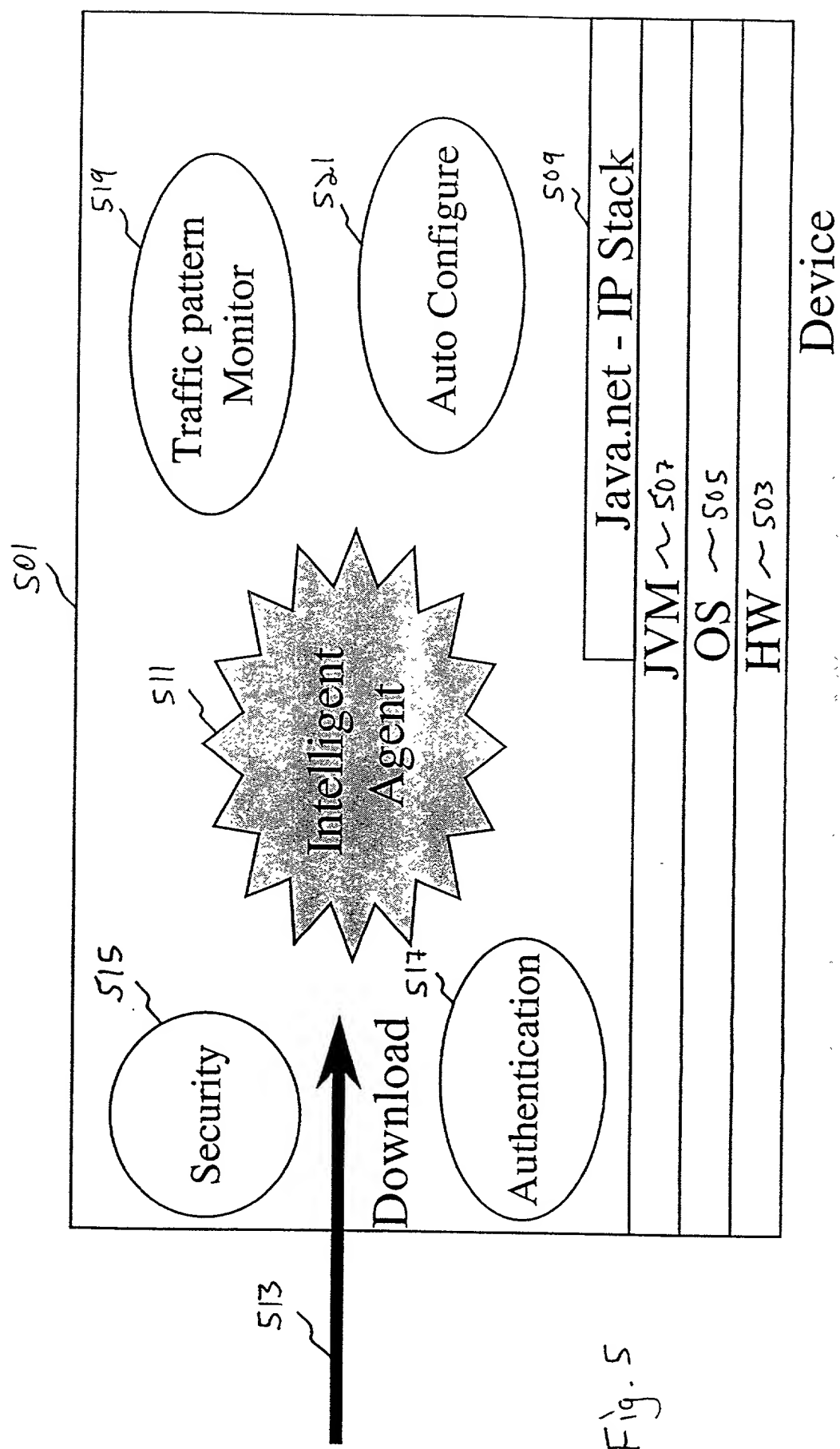
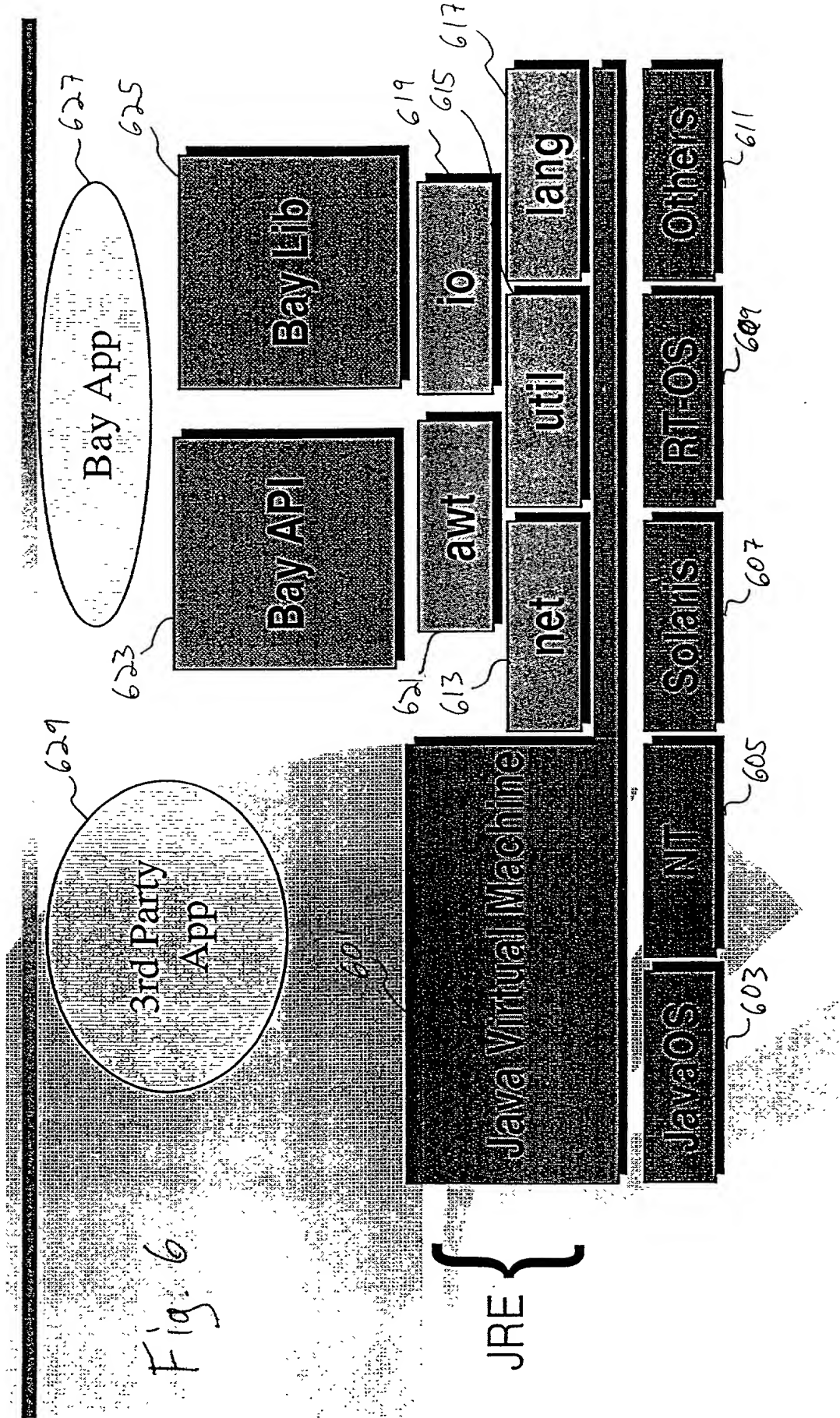
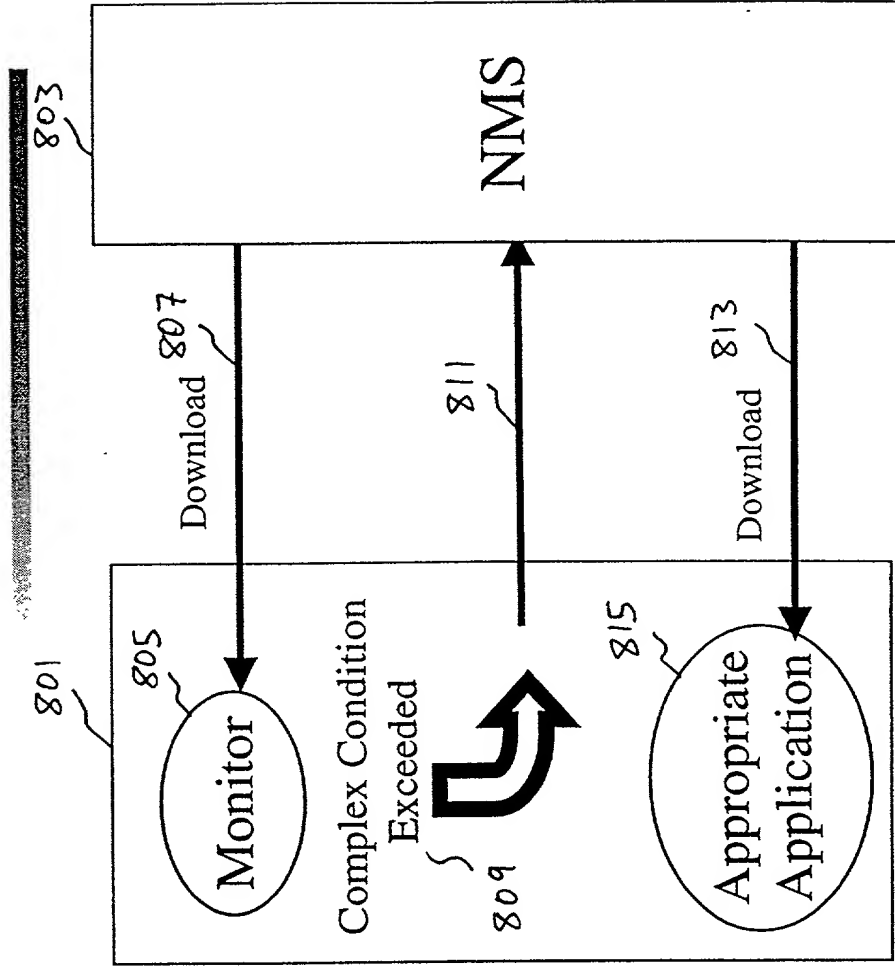


Fig. 5








$$\frac{8}{F_{ig}}$$

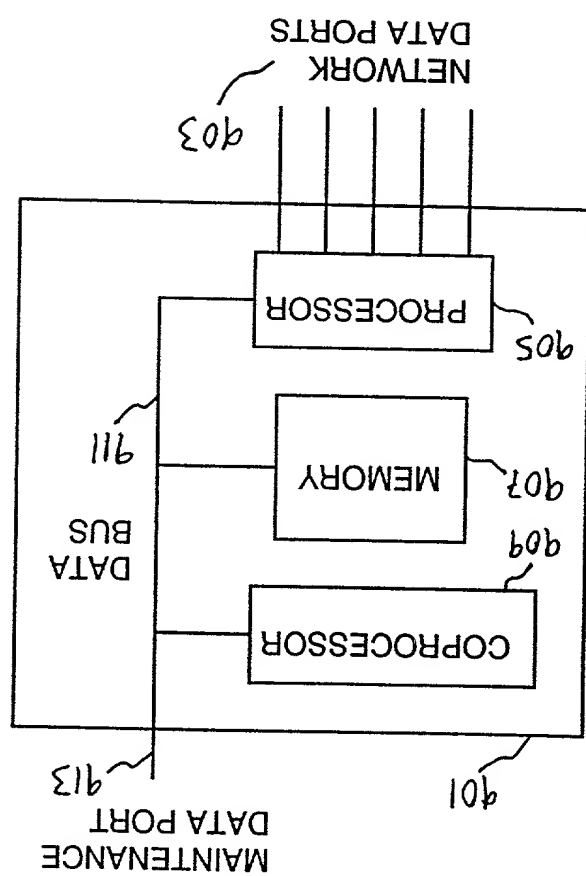


FIG. 9



## DECLARATION AND POWER OF ATTORNEY FOR PATENT APPLICATION

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below, next to my name.

I believe I am the original, first, and sole inventor (if only one name is listed below) or an original, first, and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

## METHOD AND APPARATUS FOR AUTOMATICALLY CONFIGURING A NETWORK SWITCH

the specification of which

is attached hereto.  
XX was filed on May 15, 1998 as  
 United States Application Number 09/079,890  
 or PCT International Application Number \_\_\_\_\_  
 and was amended on \_\_\_\_\_  
 (if applicable)

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment referred to above.

I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

I hereby claim foreign priority benefits under Title 35, United States Code, Section 119(a)-(d), of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

<u>Prior Foreign Application(s)</u>			<u>Priority Claimed</u>	
<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year Filed)</u>	<u>Yes</u>	<u>No</u>
<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year Filed)</u>	<u>Yes</u>	<u>No</u>
<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year Filed)</u>	<u>Yes</u>	<u>No</u>
<u>(Number)</u>	<u>(Country)</u>	<u>(Day/Month/Year Filed)</u>	<u>Yes</u>	<u>No</u>

I hereby claim the benefit under title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below

(Application Number)	Filing Date
(Application Number)	Filing Date

I hereby claim the benefit under Title 35, United States Code, Section 120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, Section 112, I acknowledge the duty to disclose all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application:

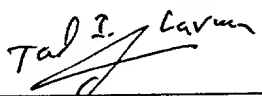
(Application Number)	Filing Date	(Status -- patented, pending, abandoned)
(Application Number)	Filing Date	(Status -- patented, pending, abandoned)

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(Name of Attorney or Agent)

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

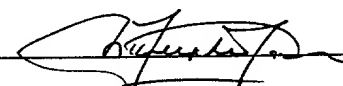
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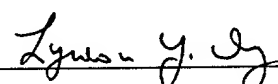
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Title 37, Code of Federal Regulations, Section 1.56  
Duty to Disclose Information Material to Patentability

(a) A patent by its very nature is affected with a public interest. The public interest is best served, and the most effective patent examination occurs when, at the time an application is being examined, the Office is aware of and evaluates the teachings of all information material to patentability. Each individual associated with the filing and prosecution of a patent application has a duty of candor and good faith in dealing with the Office, which includes a duty to disclose to the Office all information known to that individual to be material to patentability as defined in this section. The duty to disclosure information exists with respect to each pending claim until the claim is cancelled or withdrawn from consideration, or the application becomes abandoned. Information material to the patentability of a claim that is cancelled or withdrawn from consideration need not be submitted if the information is not material to the patentability of any claim remaining under consideration in the application. There is no duty to submit information which is not material to the patentability of any existing claim. The duty to disclose all information known to be material to patentability is deemed to be satisfied if all information known to be material to patentability of any claim issued in a patent was cited by the Office or submitted to the Office in the manner prescribed by §§1.97(b)-(d) and 1.98. However, no patent will be granted on an application in connection with which fraud on the Office was practiced or attempted or the duty of disclosure was violated through bad faith or intentional misconduct. The Office encourages applicants to carefully examine:

- (1) Prior art cited in search reports of a foreign patent office in a counterpart application, and
- (2) The closest information over which individuals associated with the filing or prosecution of a patent application believe any pending claim patentably defines, to make sure that any material information contained therein is disclosed to the Office.

(b) Under this section, information is material to patentability when it is not cumulative to information already of record or being made of record in the application, and

- (1) It establishes, by itself or in combination with other information, a prima facie case of unpatentability of a claim; or
- (2) It refutes, or is inconsistent with, a position the applicant takes in:
  - (i) Opposing an argument of unpatentability relied on by the Office, or
  - (ii) Asserting an argument of patentability.

A prima facie case of unpatentability is established when the information compels a conclusion that a claim is unpatentable under the preponderance of evidence, burden-of-proof standard, giving each term in the claim its broadest reasonable construction consistent with the specification, and before any consideration is given to evidence which may be submitted in an attempt to establish a contrary conclusion of patentability.

(c) Individuals associated with the filing or prosecution of a patent application within the meaning of this section are:

- (1) Each inventor named in the application;
  - (2) Each attorney or agent who prepares or prosecutes the application; and
  - (3) Every other person who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application.
- (d) Individuals other than the attorney, agent or inventor may comply with this section by disclosing information to the attorney, agent, or inventor.